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An overview of the ant fauna of Cape Arid National Park, Western Australia

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Abstract

This paper overviews the ant fauna of Cape Arid National Park (375-575 mm mean annual rainfall) in southwestern Australia, and compares it with that already described from Wyperfeld National Park (*c.* 400 mm) in northwestern Victoria. Ants were surveyed at 15 sites, primarily by pitfall trapping, during November 1988 and April 1989, with 141 species from 29 genera being recorded. Faunistic composition, in terms of the biogeographical affinities of species, the distribution of species across genera, the composition of species-groups within major genera, and the distribution of species across functional groups, was similar to that at Wyperfeld. Many species were common to both locations. The richest genera were *Camponotus* (28 species), *Iridomyrmex* (24 species) and *Melophorus* (15 species), as is typical of arid Australia. However, as is also the case at Wyperfeld, these genera included elements characteristic of more mesic regions, and Bassian genera such as *Prolasius, Notoncus, Colobostruma* and *Dolichoderus* contributed a significant proportion of species. The rich and distinctive Wyperfeld fauna, where Bassian elements are superimposed upon a typically arid assemblage, therefore appears to be characteristic of the mesic fringe (*c.* 400-500 mm mean annual rainfall) of semi-arid southern Australia.

Introduction

Semi-arid southern Australia supports some of the richest known ant faunas (Greenslade & Greenslade 1989), rivalling those of tropical lowland rainforests (Wilson 1959, 1987, Verhaagh 1990) which are generally considered to be the most diverse (Kuznezov 1957). Ant diversity is particularly high at Wyperfeld National Park (mean annual rainfall *c.* 400 mm) in the mallee region of northwestern Victoria, where a remarkable 138 species from 32 genera have been recorded from a 0.4 ha plot (Andersen 1983, Andersen & Yen 1985). This exceptional diversity can in part be explained by Wyperfeld's location on the mesic fringe of the southern arid zone, such that an already rich arid fauna is overlapped by taxa characteristic of cool-temperate (Bassian) Australia. The Wyperfeld fauna is typical of that occurring throughout the arid zone in having numerous species of *Iridomyrmex, Camponotus* and *Melophorus* (Greenslade 1979), but it also includes a substantial number of Bassian elements (Andersen 1991a) such as species of *Prolasius, Notoncus, Dolichoderus, Colobostruma* and *Podomyrma*.

The extent to which the Wyperfeld fauna is typical of the mesic fringe of the southern arid zone is unknown, as ant faunas in these regions are poorly documented. This is especially true for southern Western Australia, where there appears to be no published account of any semi-arid fauna, despite the considerable work in more mesic regions (for examples see Majer 1982, Rossbach & Majer 1983, Majer *et al.* 1984, Majer & Brown 1986). This paper provides an overview of the ant fauna of Cape Arid National Park, located 120 km east of Esperance, Western Australia, and compares it with that at Wyperfeld.

Study Sites

Cape Arid National Park (*c.* 280,000 ha) experiences a warm to dry-warm Mediterranean climate with mean annual rainfall ranging from 375 mm (northern regions) to 575 mm (coastal southern region) (Bureau of Meteorology 1971, Beard 1975). Major substrates in the Park are Proterozoic granites and gneisses, mostly overlain with Pleistocene limestone deposits in the north and sands in the south, with Recent sands being common near the coast (Lowry & Doepel 1974). The Park is at the eastern extremity of the South-West Botanical Province, on the boundary with the semi-arid South-Western Interzone (Beard 1975, 1980).

Ants were surveyed at 15 sites, arranged in three clusters of five sites in the areas of Mt Ragged, Yokinup Bay and Seal Creek (Fig 1). A summary of the soils and vegetation at each site is provided in Table 1. The mallee woodlands are part of the Cooper vegetation system, the heaths part of the Esperance System, and the remaining types are within the Fanny's Cove System (Beard 1975).

Methods

Ants were sampled using pitfall traps (4.2 cm diameter plastic vials, partly filled with ethanol as a preservative), which provide useful quantitative information on the composition of ground-foraging ants in open habitats (Andersen 1983, 1991c) such as those at Cape Arid. Very few ant species in the Australian arid zone forage exclusively in soil or on vegetation (Greenslade 1979) and thereby avoid capture in pitfall traps. A line of 10 traps with 5 m spacing was located at each of the 15 sites, and operated for a 48 hr period during November 1988. Species

were also collected opportunistically by hand. The weather was mostly fine, but with some drizzle at Mt Ragged. Maximum temperatures ranged from about 25-30°C, with temperatures being lowest during the Mt Ragged sampling period. The survey was repeated at Mt Ragged (sites 4 and 5 only) during warm weather in April 1989.

The sampling regime was designed to provide a broad coverage of the regional fauna, rather than detailed information for particular sites. Site comparisons were therefore not attempted. Most ant species in southern Australia are at or near their peak activity during November, although some species forage exclusively during winter months (Andersen 1983, 1986). Aside from the latter species, the survey was therefore likely to provide a reasonable overview of the Cape Arid fauna.

Ants were sorted to species, but the poor species-level taxonomy of Australian ants meant that only a small proportion could be named with certainty. Some other species were given names prefaced by a question mark (for example *Brachyponera ?lutea*) to indicate that the taxa require further study before they can be identified with certainty. Where possible, the remaining species were assigned to informal species-groups according to Andersen (1991a): such species are denoted by inverted commas, for example *Rhytidoponera 'metallica'*. Otherwise, unidentified species were given letter codes that apply only to this study. A full collection of voucher specimens is held by the senior author.

Patterns of community organization were examined by classifying species into functional groups according to their habitat requirements and competitive interactions. This classification is modified from Greenslade (1978), and has been widely discussed and applied elsewhere (see Andersen 1990, 1991b). There are seven groups: 1. Dominant Dolichoderinae (primarily species of *Iridomyrmex*), which are highly active and aggressive species exerting a strong influence on other ants (Greenslade 1976, Andersen 1992 *in press*); 2. Associated subordinate Camponotini (primarily species of *Camponotus*), which appear to co-exist successfully with species of *Iridomyrmex* due to their submissive behaviour, and to differences in body size and time of foraging; 3. Climate specialists: either (a) Bassian taxa (for example species of *Prolasius* and *Notoncus*) which occur predominantly in cool and wet regions, where the abundance of *Iridomyrmex* is generally low; or (b) specialized arid-adapted taxa (for example species of *Melophorus* and *Meranoplus*); 4. Cryptic and Sub-cryptic species, which forage exclusively or primarily within soil and litter; 5. Opportunists (primarily species of *Rhytidoponera*, *Paratrechina* and *Tetramorium*) which are unspecialized species with poor competitive ability that are often characteristic of disturbed sites (Andersen & McKaige 1987, Andersen & Burbidge 1991); 6. Generalized Myrmicinae (species of *Crematogaster*, *Monomorium* and *Pheidole*), which are unspecialized myrmicine species that are successful members of Australian ant communities because of their rapid recruitment and ability to defend food resources (Andersen *et al.* 1991, Andersen 1992 *in press*); and 7. Large/Solitary foragers (for example species of *Myrmecia*) which, due to their large size and low densities, do not interact greatly with other ants.

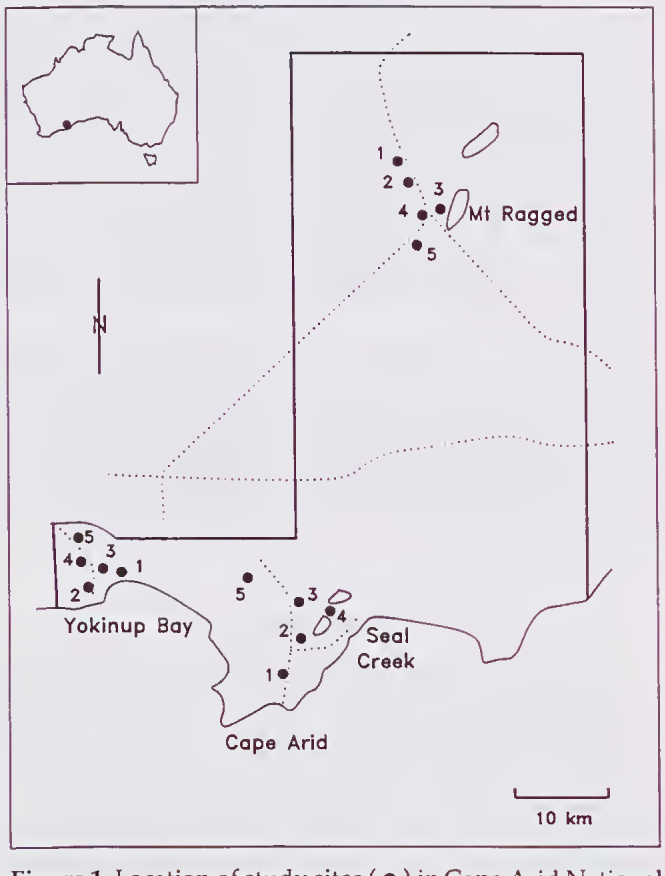

Figure 1. Location of study sites (●) in Cape Arid National Park, W.A.

Table 1

Soils and vegetation at study sites in Cape Arid National Park.

Site		Soil	Vegetation
Mt Ragged			
	1	calcareous loam/limestone	mallee woodland
	2	calcareous loam/limestone	mallee woodland
	3	lateritic podzol	heath
	4	siliceous sand	*Banksia* woodland
	5	calcareous loam/limestone	mallee woodland
Yokinup Bay			
	1	calcareous sand	dune shrubland
	2	siliceous sand	*Banksia* woodland
	3	dark loam	eucalypt woodland
	4	sand over clay	heath
	5	gravelly sand over clay	heath
Seal Creek			
	1	sand over laterite	heath
	2	siliceous sand	heath
	3	sand over clay	heath
	4	gravelly sand over clay	heath
	5	siliceous sand	dune shrubland

Results

Faunistic Composition

A total of 141 species from 29 genera were collected (a species list is included as an Appendix). This is by no means the complete regional fauna, as the species accumulation curve (Fig 2) continues to rise, and 64 (45%) of the species were recorded at only one site. The high turnover of species across sites can be attributed to a combination of the relatively low sampling intensity at each site, and the patchy distribution of species (see Table 3 for examples of the latter). This makes it impossible to give a reliable estimate of the total number of species in the region.

The mean number of species per genus (4.9) is similar to that at Wyperfeld (4.6), and falls between that of more mesic (for example 2.9 at Kangaroo Island, SA; 550 mm mean annual rainfall) and more arid (for example 6.3 at

Table 2

Ant community organization at Cape Arid (present study) compared with Wyperfeld (Andersen 1983, 1984, Andersen & Yen 1985; heath and mallee sites combined, pitfall trap data only). Taxa are classified into functional groups (see text), and data are total numbers of species recorded (including hand collections) and, in brackets, mean percentage abundance in pitfall traps (excluding hand collections) during November. The Cape Arid sites have been grouped according to their location in the Mt Ragged (MR), Yokinup Bay (YB) or Seal Creek (SC) areas. Some genera were found at Wyperfeld but not at Cape Arid; these are listed as 'other' and are included in Wyperfeld species totals.

Category/Genera	Cape Arid				Wyperfeld
	MR	YB	SC	TOTAL	
1. DOMINANT DOLICHODERINAE					
Iridomyrmex	6(43)	11(48)	6(54)	19(49)	13(35)
Other	—	—	—	—	2
Sub-total	6(43)	11(48)	6(54)	19(49)	15(35)
2. ASSOCIATED SUBORDINATE CAMPONOTINAE					
Camponotus	9(5)	16(7)	9(9)	28(7)	29(2)
Notostigma	0	0	1(<1)	1(<1)	0
Polyrhachis	2(<1)	2(<1)	1(<1)	3(<1)	5(<1)
Sub-total	11(5)	18(7)	11(9)	32(7)	34(2)
3. CLIMATE SPECIALISTS					
(a) Cold Climate Specialists					
Colobostruma	0	0	1(<1)	1(<1)	2(<1)
Dolichoderus	1(0)	1(0)	0	1(0)	3(<1)
Notoncus	2(0)	1(2)	2(1)	4(1)	3(<1)
Prolasius	0	1(<1)	1(1)	2(<1)	1(<1)
(b) Hot Climate Specialists					
Adlerzia	0	1(<1)	0	1(<1)	1(<1)
Anisopheidole	0	0	1(<1)	1(<1)	1(<1)
Cerapachys	0	1(1)	1(<1)	2(<1)	2(<1)
Melophorus	8(<1)	8(9)	3(<1)	15(3)	13(8)
Meranoplus	3(11)	1(<1)	2(1)	5(4)	3(1)
Monomorium ('Chelauer')	2(1)	2(<1)	3(4)	6(2)	4(<1)
Other	—	—	—	—	6
Sub-total(a + b)	16(12)	16(13)	14(8)	38(11)	39(9)
4. CRYPTIC OR SUB-CRYPTIC SPECIES					
(a) Cryptic Species					
Brachyponera	1(0)	0	1(<1)	1(<1)	1(<1)
Solenopsis	0	1(<1)	1(<1)	2(<1)	1(<1)
Acropyga	1(0)	0	0	1(0)	1(<1)
(b) Sub-cryptic Species					
Bothriomyrmex	1(0)	1(0)	0	1(0)	0
Iridomyrmex 'darwinianus'	2(2)	1(2)	1(6)	3(3)	1(9)
Plagiolepis	0	0	2(<1)	2(<1)	2(<1)
Stigmacros	1(0)	3(1)	0	3(<1)	13(2)
Tapinoma	1(0)	1(<1)	0	1(<1)	0
Other	—	—	—	—	2
Sub-total(a + b)	7(2)	7(4)	5(6)	14(4)	21(11)
5. OPPORTUNISTS					
Aphaenogaster	1(10)	0	0	1(3)	1(<1)
Iridomyrmex 'glaber'	2(0)	0	0	2(0)	2(<1)
Rhytidoponera	2(12)	2(4)	1(4)	3(7)	0
Tetramorium	2(0)	1(1)	2(<1)	3(<1)	2(<1)
Sub-total	7(22)	3(5)	3(4)	9(10)	5(<1)
6. GENERALIZED MYRMICINAE					
Crematogaster	3(9)	1(<1)	0	6(3)	6(3)
Monomorium	5(2)	7(20)	1(2)	8(8)	8(35)
Pheidole	2(4)	1(3)	1(12)	4(6)	6(4)
Sub-total	10(15)	9(23)	2(14)	18(17)	20(42)
7. LARGE, SOLITARY FORAGERS					
Myrmecia	1(0)	5(2)	2(2)	9(1)	4(<1)
Platythyrea	1(0)	0	1(0)	2(0)	0
Sub-total	2(0)	5(2)	3(2)	11(1)	4(<1)
TOTAL	59(100)	69(100)	44(100)	141(100)	138(100)

Table 3

Distribution of *Iridomyrmex* species across sites. Data are numbers of ants recorded in pitfall traps during November (dashes indicate zero records).

	Mt Ragged					Yokinup Bay					Seal Creek				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
Iridomyrmex sp A	—	—	19	—	1	—	—	—	—	147	—	163	—	—	—
I. 'bicknelli' sp A	—	—	—	—	—	29	—	—	98	7	—	—	—	—	—
I. 'bicknelli' sp D	—	—	—	—	—	—	—	—	—	—	—	—	—	54	14
I. 'conifer' sp A	43	—	—	65	—	—	—	—	—	—	—	—	—	—	—
I. 'conifer' sp B	—	—	—	—	—	79	—	—	—	—	—	—	—	—	—
I. 'conifer' sp C	—	—	—	—	—	—	507	—	19	—	110	92	—	58	28
I. 'dromus' sp B	—	—	—	6	—	—	—	—	—	—	—	66	76	25	—
I. 'gracilis' sp A	3	77	6	—	—	—	—	1	—	—	—	—	—	—	—
I. 'itinerans' sp A	—	—	—	—	—	20	—	3	—	1	—	—	—	—	—
I. 'purpureus'	—	—	—	—	—	—	—	28	—	20	—	—	—	—	—
all others	—	9	—	—	—	5	1	—	5	2	—	—	—	1	7

Cambrai, SA; 350 mm) sites (data from Greenslade & Greenslade 1989). The richest genera were *Camponotus* (28 species), *Iridomyrmex* (24 species) and *Melophorus* (15 species), as is typical of the Australian arid zone. These three genera together comprised 47% of total species, compared with 42% at Wyperfeld. They typically comprise a greater proportion of species at more arid sites (for example, 62% at Cambrai), and a lesser proportion at more mesic sites (for example, 31% at Kangaroo Island).

The overlap of Bassian and Eyrean (arid) taxa that is distinctive of Wyperfeld also occurs at Cape Arid. At Cape Arid, 27% of the species belong to Eyrean taxa, 16% to Bassian taxa, and the remainder (57%) to widespread taxa (see Appendix). These figures are almost identical to those at Wyperfeld: 28%, 17% and 55% respectively. As at Wyperfeld, Cape Arid supports Bassian taxa such as *Iridomyrmex 'itinerans'*, *Camponotus 'innexus'* and species of *Notoncus*, *Prolasius*, *Dolichoderus* and *Colobostruma*. More generally, the Cape Arid fauna is very similar to that at Wyperfeld at the species-group level. For example, the major species-groups of *Iridomyrmex* at Cape Arid were *'bicknelli'*, *'gracilis'*, *'dromus'*, *'darwinianus'* and *'itinerans'*, as they are at Wyperfeld, and the same goes for the *'claripes'*, *'ephippium'* and *'ceriseipes'* groups of *Camponotus*. Indeed, many species collected at Cape Arid appear to be identical to those from Wyperfeld, including *Brachyponera ?lutea*, *Adlerzia froggatti*, *Anisopheidole antipodum*, *Notostigma sanguinea*, *Aphaenogaster ?barbigula*, and *Camponotus whitei*.

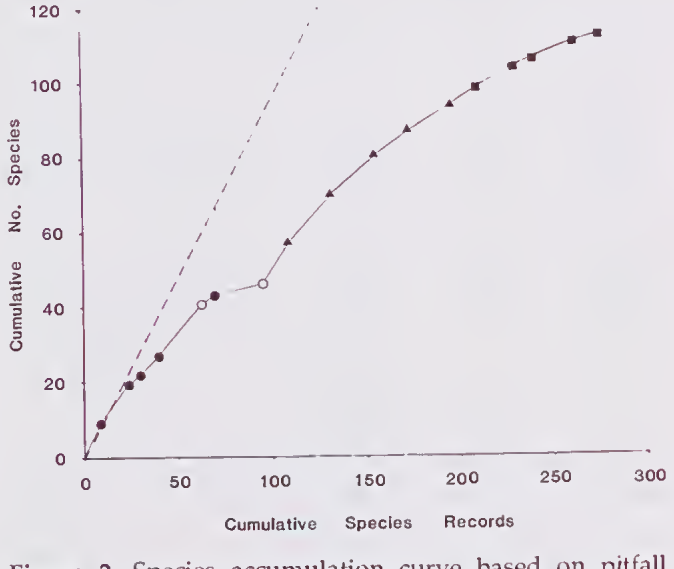

Figure 2. Species accumulation curve based on pitfall catches (● Mt Ragged sites, November; Mt Ragged sites April; ▲ Yokinup Bay sites, ■ Seal Creek sites). The dashed line represents the situation where every species record is different.

Community Organization

Dominant species of *Iridomyrmex* contributed about half of the total ants in traps (Table 2), with individual species distributed patchily across (Table 3) and within (Table 4) sites. Each of the three areas sampled supported a distinctive suite of *Iridomyrmex* species. Within the *conifer* group, for example, sp A was found only in the Mt Ragged area (Table 3). Species of *'conifer'* were abundant at nine of the 15 sites, with two species never recorded together. *Iridomyrmex 'bicknelli'* sp. D was only recorded at Seal Creek sites, *I. 'itinerans'* and *I. 'purpureus'* only at Yokinup Bay sites, and all but one specimen of *I. 'gracilis'* sp. A was recorded at Mt Ragged sites. Of the eleven common species, only *Iridomyrmex* sp A was found at all three groups of sites. Patchiness of *Iridomyrmex* species was also pronounced within sites. At Mt Ragged site 5 during April, for example, species of *Iridomyrmex* were recorded in all traps, but individual species tended to be mutually exclusive (Table 4).

The overall abundance of dominant *Iridomyrmex* at each site exhibited a humped relationship with total species richness (Fig 3). If it is assumed that the abundance of *Iridomyrmex* reflects environmental favourability for ants (Andersen 1992 *in press*), then this pattern is consistent with the suppression of diversity by dominant species under favourable conditions, following the Grime (1973), Connell (1978) and Tilman (1982) models of the control of local

Table 4

Distribution of *Iridomyrmex* species in individual pitfall traps at Mt Ragged site 5 during April 1989 (dashes indicate zero records).

	Trap No.									
	1	2	3	4	5	6	7	8	9	10
Iridomyrmex sp A	5	—	1	—	10	—	—	—	—	—
I. 'bicknelli' sp A	—	4	—	—	—	23	—	—	—	12
I. 'gracilis' sp A	—	—	1	6	21	—	50	50	36	—

diversity in communities of plants and sessile marine invertebrates. Humped diversity patterns in ant communities, caused by competition from *Iridomyrmex*, have been previously documented at tuna baits in northern Australia (Andersen 1992 *in press*).

Associated subordinate Camponotini (total of 35 species, mostly belonging to *Camponotus*) and climate specialists (38 species, mostly belonging to *Melophorus*, *'Chelaner'* and *Meranoplus*) together contributed exactly half of the total species recorded, but represented less than 20% of ants collected in traps. The four truly cryptic species recorded (*Acropyga* sp., *Brachyponera ?lutea* and two species of *Solenopsis*) were each represented by a single individual in traps. Species of the *darwinianus* group of *Iridomyrmex* were locally common, especially in the Seal Creek area, but other sub-cryptic species were only rarely recorded. The most common opportunist was *Rhytidoponera 'metallica'*, which was recorded at 12 of the 15 sites. Generalized myrmicines averaged 17% of total ants in traps, but different genera predominated in the three areas: *Crematogaster* at Mt Ragged sites, *Monomorium* at Yokinup Bay sites, and *Pheidole* at Seal Creek sites. Nine species of *Myrmecia* (Large/Solitary foragers) were recorded, but they comprised only about 1% of total pitfall catches.

Pitfall trap data are also available for Wyperfeld (Table 2). In terms of numbers of species, the functional group profiles of the two locations are very similar, except far fewer species of Large/Solitary foragers were recorded at Wyperfeld (4) than at Cape Arid (11). The relative abundance of dominant *Iridomyrmex* at Cape Arid was somewhat higher than at Wyperfeld (49% compared with 35%), and generalized myrmicines substantially lower (17% compared with 42%). In particular, the very high abundance of *Monomorium* recorded at Wyperfeld (35% total ants in traps) was observed at only one of the 15 Cape Arid sites.

Discussion

Comparisons between the ant faunas of Cape Arid and Wyperfeld are constrained by major differences in sampling area and intensity: at Cape Arid a large area was surveyed at a low intensity, whereas the reverse was true at Wyperfeld. This makes it impossible to compare species richness at the two locations, and difficult to interpret differences in the relative abundances of major taxa. For example, it is not known if the high abundance of *Monomorium* at Wyperfeld is representative of the region as a whole, or is peculiar to the site studied. Similarly, the fewer species of Large/Solitary foragers recorded at Wyperfeld reflects the small area sampled.

However, the data do allow for broad comparisons of faunistic composition. Like Wyperfeld, Cape Arid National Park supports a rich ant fauna composed of a framework of arid zone taxa which is overlapped by a broad range of Bassian elements. (Interestingly, a mixing of Bassian and arid zone taxa is also evident in the vascular plants and vertebrate animals at Cape Arid, but in these groups it is the Bassian taxa which predominate [A H Burbidge, G J Keighery, J K Rolfe & J J Alford, unpublished data]). Moreover, faunistic composition is similar at the two locations at the species-group level, and also in terms of the distribution of species across functional groups. There is, however, at least one important compositional difference: the *conifer* group of *Iridomyrmex* was a major component of the Cape Arid fauna, but does not occur at Wyperfeld (it is endemic to southwestern Australia). Three species of the group were recorded in the present study: they were among the most abundant ants collected, and appear to be the leading dominant ants in the region (Table 3). Their nest mounds were a conspicuous feature of the landscape, particularly on well-drained sandy soils.

The similarity of the Cape Arid ant fauna to that at Wyperfeld suggests that the rich and biogeographically distinctive Wyperfeld fauna is characteristic of the semi-arid/sub-humid zone (*c.* 400-500 mm mean annual rainfall) throughout much of the southern fringe of arid Australia. However, a major question remains to be addressed: just how diverse is the ant fauna of semi-arid southern Australia? Some species appear to occur throughout the region, but far more information is required on the distributions of other species before we can know if the answer is many hundreds or thousands of species.

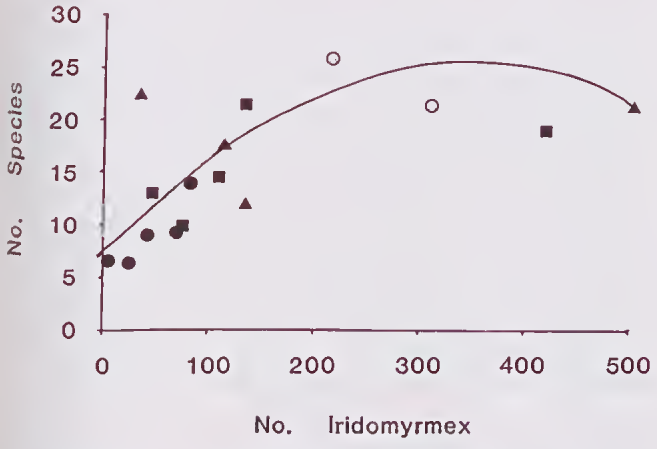

Figure 3. Relationship between total number of species and the abundance of dominant *Iridomyrmex* recorded at each site (symbols as in Fig 2). The regression equation is $y = 8.0 + 0.09x - 0.0001x^2$, $r^2 = 0.51$. The quadratic model gives a greater r^2 than either linear ($r^2 = 0.35$) or logarithmic ($r^2 = 0.40$) models.

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Appendix

List of ant species recorded at Cape Arid National Park, WA. Authorities for species names are given in Taylor and Brown (1985). The biogeographical affinities (E = Eyrean; B = Bassian; W = widespread) of each species is given in brackets.

Myrmeciinae

Myrmecia analis (W), *M. chasei* (W), *M. clarki* (W), *M. ?mandibularis* (W), *M. vindex* (W), *M. ?decipians* (W), *M.* sp. nr. *swalei* (W), *M. ?tepperi* (W), *M.* sp. nr. *urens* (W).

Ponerinae

Brachyponera ?lutea (W); *Cerapachys gilesi* (W); *Cerapachys incontentus* (E); *Platythyrea dentinodis* (B), *P. micans* (B); *Rhytidoponera* sp. nr. *anceps* (W); *R. 'metallica'* (W), *R. punctata* (W).

Myrmicinae

Adlerzia froggatti (E); *Anisopheidole antipodum* (E); *Aphaenogaster ?barbigula* (W); *Colobostruma ?cerornata* (B); *Crematogaster* spp (x 5;W); *?Mayriella* sp. (B); *Meranoplus* spp (x 5;E); *Monomorium ('Chelaner')* spp (x 6;E,B), other *Monomorium* spp (x 8;W); *Pheidole* spp (x 4;W); *Solenopsis* spp (x 2;W); *Tetramorium* spp (x 3;W).

Dolichoderinae

Bothriomyrmex sp. (W); *Dolichoderus 'scabridus'* (B); *Iridomyrmex 'bicknelli'* (4 spp;W), *I. 'conifer'* (3 spp;W), *I. 'darwinianus'* (3 spp;W), *I. 'dromus'* (4 spp;E), *I. 'glaber'* (W), *I.* sp. nr. *glaber* (W), *I. 'gracilis'* (3 spp;W), *I. 'itinerans'* (B), *I.* sp. nr. *purpureus* (E), other *Iridomyrmex* spp (x 3;W); *Tapinoma 'minutum'* (W).

Formicinae

Acropyga sp (W); *Camponotus 'ceriscipes'* (3 spp;E), *C. 'eplippium'* (4 spp;E), *C. 'innexus'* (2 spp;B) *C. 'intrepidus'* (B), *C. 'nigriceps'* (E), *C. 'rubiginosus'* (2 spp;W), *C. 'testaceipes'* (2 spp;B), *C. ?whitei* (E), other *Camponotus* spp (12 spp;W); *Melophorus* spp (x 15;E); *Notoncus 'enormis'* (3 spp;B), *N. 'gilberti'* (B); *Notostigma sanguinea* (W); *Plagiolepis* spp (x 2;W); *Polyrhachis ?perthensis* (B), *P.* sp. nr. *patieus* (B), *P. ('Campomyrma')* sp(B); *Prolasius* spp (x 2;B); *Stigmacros ('Campostigmacros')* spp (x 2;W), *S. ('Stigmacros')* sp (W).